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DISTRICT OF ALGOMA

THE

ONTARIO WATER RESOURCES

COMMISSION

WATER POLLUTION SURVEY

of

HAVILLAND BAY

DISTRICT OF ALGOMA

1971

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R E P O R T

ON

WATER POLLUTION SURVEY

OF

HAVILLAND BAY

(Township of Havilland)

DISTRICT OF ALGOMA

JUNE 1971

ONTARIO WATER RESOURCES COMMISSION

DISTRICT ENGINEERS BRANCH

DIVISION OF SANITARY ENGINEERING

The author gratefully acknowledges the receipt of maps and other materials from the Department of Lands and Forests. Their use greatly expediated the organization of this survey and the preparation of this report.

The laboratory work carried out in conjunction with this survey was performed by the Ontario Water Resources Commission's Division of Laboratories in Toronto.

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ONTARIO WATER RESOURCES COMMISSION

1.0 INTRODUCTION

A water pollution survey of the settlement of Havilland Bay [1] in the Township of Havilland was conducted on June 15, 1971, in an effort to locate, sample and evaluate most existing sources of pollution. Surveys of this nature are performed upon request by the O.W.R.C.'s District Engineers Branch, Division of Sanitary Engineering, as an aid for determining the need of sewage treatment requirements.

During the survey only one outfall pipe was observed and sampled. All roadside ditches and creeks as well as the entire shoreline from the mouth of the Stokely Creek towards the northwest limit of the built up area were also sampled for bacteriological and chemical analysis. A total of 40 bacteriological and 3 chemical samples were analysed.

At the time of the survey the temperature was approximately 60° F and the sky was free of cloud cover. No heavy rainfall had occurred for several days preceding the survey.

(1) The spelling of Havilland Bay is taken from the Gazetteer of Canada (Ontario), 1962.

2.0 SCOPE AND INTENT

The pollution survey was confined to that part of the Havilland Bay lying along the old Highway 17 between its intersection with Stokely Creek and its termination at the Trans Canada Highway. It was decided to confine the survey to that particular area since several local residents had expressed concern regarding the pollution of the adjacent watercourses by neighbouring establishments. Their concern grew after a portion of the old highway was ditched and drained into the bay during the first weeks of June, 1971, by the Department of Transportation and Communications (then called the Department of Highways).

The survey involved the examination and sampling of all local watercourses and ditches, a review of O.W.R.C. files and a summary of the past water quality of the bay. This information together with the analytical results of all samples obtained during the survey was reviewed to establish the past and existing water pollution problems.

The report attempts to seek out areas of pollution within the settlement, and presents recommendations which should be implemented to alleviate these conditions in the future.

3.0 BACKGROUND

3.1 Location

The settlement of Havilland Bay is located in the unorganized Township of Havilland approximately 25 miles north of the City of Sault Ste. Marie just west of the Trans Canada Highway. It is situated on the south and east shores of the Batchawana Bay of Lake Superior.

The Township contains about 23,040 acres of which almost one-half is water and the remainder is high and rolling land with outcrops of rock ridges falling gradually to the bay. The area contains several small spring fed creeks which flow through the predominately rich sandy loam into the bay at various locations. The largest of these, Stokely Creek, has a fall of approximately 60 feet in two hundred at one location.

The prevailing rock outcrops are composed of gneiss and a hard hornblendic slate and the river beds are often formed of red sandstone. Cliffs ranging from 60 to 100 feet in height in the vicinity of Havilland Bay support small growths of white pine trees. The rolling hills to the east and south are covered with strands of maples intermingled with black birch and balsam trees.

3.2 History

Since the Township is unorganized an adequate history of its settlement was not obtained. A library search of historical papers indicated that the Batchawana (Batchawanung) and Goulais Bay areas were first settled in 1863 by fur traders, miners and subsistance farmers. The Havilland Bay area was probably developed in the mid 1900's to serve as a cottage-type settlement. It is presently being used by both permanent residents and summer cottage owners.

There are only two commercial establishments in the section of Havilland Bay investigated; one Hotel-Motel complex and one Confectionary Store. There are eight dwellings on the east side of the Trans Canada Highway and approximately three dozen summer and permanent cottages are located in the remainder of the area studied.

3.3 Past Surveys

A bacteriological water quality monitoring programme is being carried out by the Department of Lands and Forests on a routine basis during the recreational season. Samples are normally obtained on a weekly basis at the following locations:

1. Stokely Creek - south of the old Highway 17
2. Havilland Bay (3 offshore locations)
3. Mouth of newly constructed offtake ditch

4. Mouth of creek just east of Stokely Creek
5. Creek at intersection of old Highway 17 just east of Trans Canada Highway
6. Confined area of Havilland Bay - east of causeway

A summary of the analytical results of the samples obtained during the summer of 1970 is presented in Appendix A.

Several surveys of the sewage disposal and water supply systems have been carried out in the past by the Northern Ontario Health Services Branch of the Ontario Department of Health. Some major changes to the disposal systems investigated have been made as a result of these.

3.4 Topography

The study area is relatively flat and sandy and slopes gently into the waters of Lake Superior. The sand layer extends to and below the water table at most locations. The study area is crossed by several spring fed creeks and numerous drainage ditches. Rock outcrops are confined to the north and east limits of the bay.

4.0 EXISTING SERVICES

4.1 Water Supply

The settlement is presently served by individual wells of either the "dug", "drilled" or "driven" types. Many of the cottages are situated on sand which is ideal for the development of the latter supply. The majority of the drilled wells have a positive head producing a continual flow of adequate drinking water for many homes and cottages.

There are no known communal water supply systems in the area studied; however, McCauley's Havilland Bay Hotel does supply drinking water to one adjacent home.

4.2 Waste Disposal

Private septic tank and tile field disposal systems are generally being used for the disposal of domestic wastes. The installation of these units have been supervised by the Department of Health's Northern Ontario Health Service. That Department is responsible for the approval of these systems since the Township is unorganized. Several pit privies were also observed to be in use.

A review of the O.W.R.C. files has indicated that problems with the proper operation of these units had resulted in the past. During 1967 the sewage disposal practices were critized by the public and action by the O.W.R.C. and the Department of Health in 1968 appeared to have resolved the situation.

There are no communal sanitary sewage collector or disposal systems in the settlement.

5.0 RESULTS OF SURVEY

The analytical results of the bacteriological samples collected during the survey are presented in Tables 1, 2 and 3; the corresponding sampling locations are depicted on the accompanying map of the study area (see Appendix B). Table 4 summarizes the chemical analyses results. An explanation of the various parameters examined as well as their significance is presented in Appendix C.

The commonly used indicators of domestic wastes in a water body are coliform organisms, biochemical oxygen demand

($B.O.D._5$), and anionic detergents (A.B.S.). The Commission's objectives (1) for the first parameter are 1,000 per 100 ml. total coliforms and 100 per 100 ml. faecal coliforms in a series of at least 10 samples per month. Natural watercourses should contain less than 4 ppm of each of the latter substances.

The bacteriological quality of the lake water sampled is summarized in Table one. The figures indicate that the bay water between the Lapointe residence and the Stokely Creek is of acceptable quality for recreational use. Ninety-three percent of the fourteen samples collected contained ten or less faecal coliform organisms per 100 ml. of sample. Fifty-seven percent of these samples also contained ten or less total coliform organisms per 100 ml. of sample. Based on these results, the bay water as defined was very acceptable for recreational sports at the time of this survey; however, it should be dissinfected if used for drinking purposes.

Only three bacteriological water samples were collected within the area of the bay confined by the Trans Canada Highway causeway. All of these contained total coliform bacteria

(1) Ontario Water Resources Commission, Guidelines and Criteria for Water Quality Management in Ontario, Toronto, June 1970.

TABLE ONE

HAVILLAND BAY

BACTERIOLOGICAL REPORT - LAKE WATER

SAMPLING		COLIFORM BACTERIA PER 100 ml.	
NUMBER	LOCATION	FAECAL	TOTAL
1	Bay-Lapointe Res.	L *10	40
2	Bay-North limit of pond	30	1,500
3	Bay-South limit of pond	70	3,900
4	Bay-at Hwy. 17-N	30	1,800
5	Bay-eastend-100'out	L 10	10
6	Bay-eastend-100' out	L 10	120
7	Bay-end of dock	10	170
8	Bay-central-100' out	L 10	190
9	Bay-westend-100' out	L 10	10
10	Bay-westend-100' out	L 10	90
11	Bay-westend-700' out	L 10	10
12	Bay-westend-200' out	L 10	L 10
13	Bay-westend-200' out	L 10	10
14	Bay-central-200' out	L 10	10
15	Bay-eastend-200' out	L 10	10
16	Bay-eastend-200' out	L 10	L 10

* L means "less than"

in excess of the Ontario Water Resources Commission criterion of 1,000 per 100 ml. of samples. Recreational use of this portion of the bay should be discouraged.

The bacteriological quality of the creek water entering the study area is summarized in Table two. The creek flowing into the confined area of the bay was sampled at its intersection with the old Highway 17 and found to contain 100(1) faecal coliform organisms. A water sample collected upstream of the developed area was found to contain less than 10 faecals.

The small creek flowing into the old Highway 17 ditch just south of the hotel was sampled at five locations and found to contain ten or less faecal coliforms at four of these. Five hundred total and 30 faecal coliform bacteria were detected adjacent to the overnight campsite.

The Stokely Creek was sampled at its mouth and its quality was found to be well within the recreational criteria set by the Ontario Water Resources Commission.

(1) Note: All bacteriological results are expressed in terms of organisms per 100 ml. of samples.

TABLE TWO

HAVILLAND BAY

BACTERIOLOGICAL REPORT - Creek Water

SAMPLING NUMBER	LOCATION	COLIFORM BACTERIA PER 100 ml. FAECAL	TOTAL
17	Creek east of old Hwy. 17-south of existing highway	100	290
18	Creek upstream of 'Bar B' Camp	L 10	110
19	Creek at Stockman residence	L 10	100
20	Creek upstream of Stockman residence	L 10	L 10
21	Creek-upstream of trailer camp	L 10	250
22	Creek-downstream of trailer camp	30	500
23	Mouth of creek	10	360
24	Stokely Creek-at old Hwy. 17	40	390

Sixteen ditch water samples were collected during the survey and the results of their bacteriological examination are summarized in Table three. None of these samples contained 100 or less coliforms per 100 ml. of sample. Excessive concentrations of coliform bacteria including faecal coliforms were noted in the newly constructed off-take ditch from the west side of the old highway to its intersection with the bay. Total coliform and faecal concentrations as high as 56,000 and 340 respectively were present. High faecal coliform colonies were found in the stagnant newly constructed roadside ditches along both sides of the old Highway 17. The low lying area just to the west of the Trans Canada Highway between the hotel driveway and the bay also contained faecal coliforms greater than 100.

Three chemical samples of the ditch water were also collected during the survey and their analytical results are indicated in Table four. The figures show that organic wastes are definitely gaining access to the drainage ditches since high concentrations of $B.O.D._5$ and suspended solids were detected. Excessive nutrients, in the form of total phosphorus and Kjeldahl nitrogen were also found.

TABLE THREE

HAVILLAND BAY

BACTERIOLOGICAL REPORT - Ditch Water

SAMPLING		COLIFORM BACTERIA PER 100 ml.	
NUMBER	LOCATION	FAECAL	TOTAL
25	Front of Ross residence	L 100	130
26	East of Hwy. 17 North-at 3rd culvert south of Hwy. 17	10	390
27	Hwy. 17-N-front of Jones residence	L 10	250
28	Hwy. 17-N-front of Gallagher residence	160	2,000
29	Hwy. 17-N-front of Taylor residence	L 10	850
30	Hwy. 17-N-west side	210	1,400
31	Mouth of new off-take ditch	340	14,800
32	Off-take ditch at old Hwy. (N-W side of hwy.)	340	56,000
33	Ditch flowing into off-take ditch (S-E side of hwy.)	300	50,000
34	New ditch-opposite Hotel (S-E side of hwy.)	100	3,100
35	New ditch-opposite Hotel (N-W side of hwy.)	L 10	29,000
36	New ditch west of Hotel (S-E side of Hwy.)	30	2,700
37	New ditch west of Hotel (N-W side of hwy.)	200	300
38	Old ditch-front of Stockman residence (South side of hwy.)	L 10	140
39	Old ditch-front of Wyuka res. (North side of hwy.)	200	900
40	Outfall from Trailer Camp	L 10	L 10

TABLE FOUR

HAVILLAND BAY

CHEMICAL REPORT - DITCH WATER

SAMPLING NUMBER	LOCATION	BOD_5 (ppm)	S.S. (ppm)	TOTAL (as P) PHOSPHORUS (ppm)	TOTAL KJELDAHL NITROGEN (ppm)
1	Mouth of newly constructed off-take ditch (water)	4.5	15	4.5	0.20
2	Mouth of newly constructed off-take ditch (scum) (1)	320	3,250	60.0	6.0
3	New ditch opposite Hotel (E)	24	60	12.0	0.60

(1) Microscopic examination of the floating material showed it to be pine pollen. The sample also contained large quantities of decayed algae and bacteria.

6.0 DISCUSSION

6.1 Past Surveys

During 1970 staff of the Department of Lands and Forests obtained numerous bacteriological water samples from the beach area as well as several drainage creeks discharging into the bay. The locations sampled are depicted on the accompanying map (Appendix B) and their analytical results are presented in Appendix A. A graphical summary indicating the percent of samples which exceeded the O.W.R.C. criteria for the bacteriological quality of a natural watercourse is presented in Figures one and two. The former describes the beach samples and the latter the drainage creek samples.

Several surveys of Havilland Bay were also conducted in the past by the Department of Health's Northern Ontario Public Health Services Branch. In 1969 an inspection of numerous septic tank systems was made to ensure that all systems were functioning properly. The owners of all defective works were instructed to carry out the necessary repairs.

The Department of Health also continuously monitors the bathing areas of the bay to ensure that the water quality is acceptable for recreational use at all times.

FIGURE ONE

PERCENT OF SAMPLES EXCEEDING O.W.R.C. BACTERIOLOGY CRITERIA

- DEPARTMENT OF LANDS AND FORESTS STUDY -

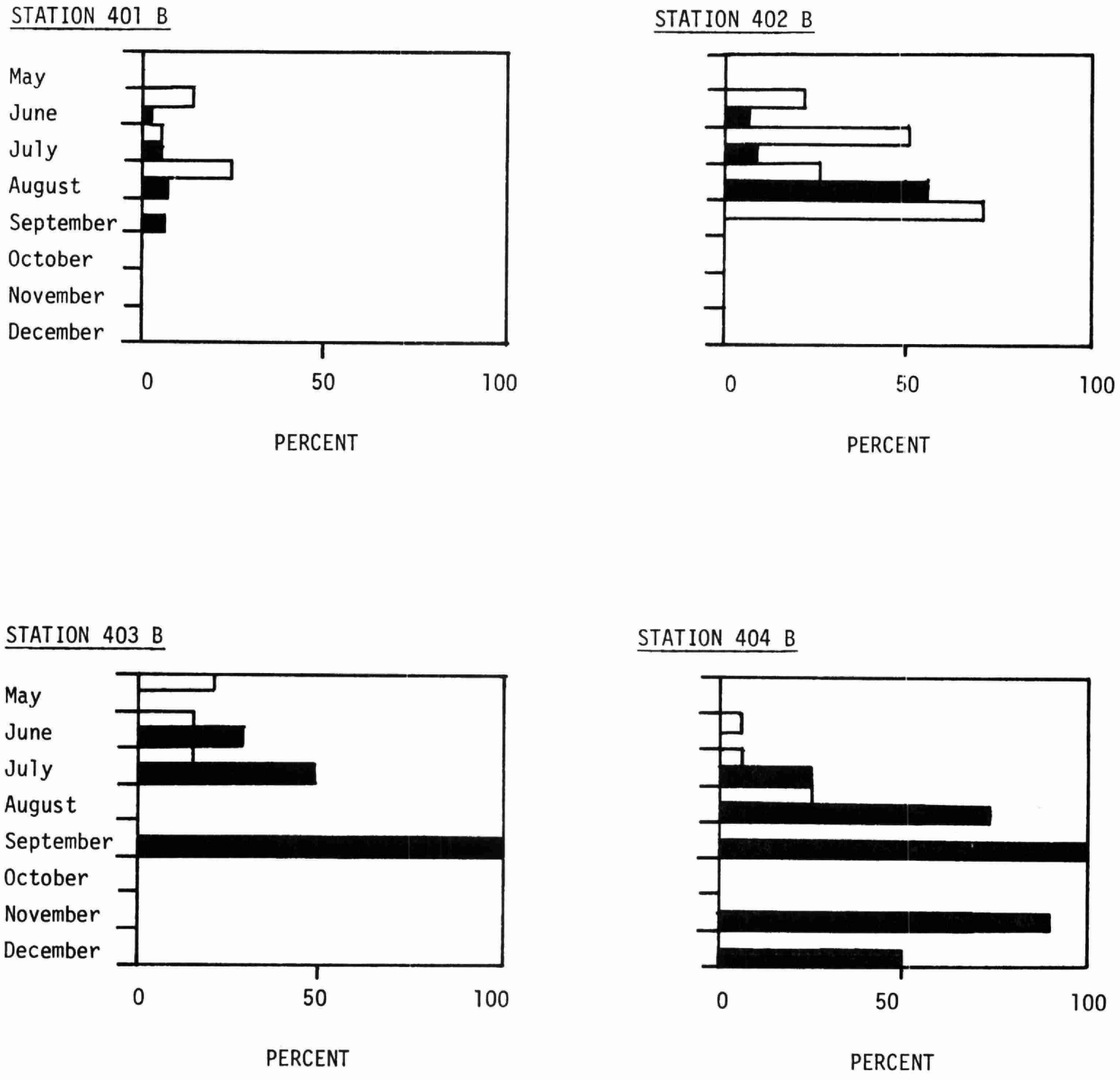
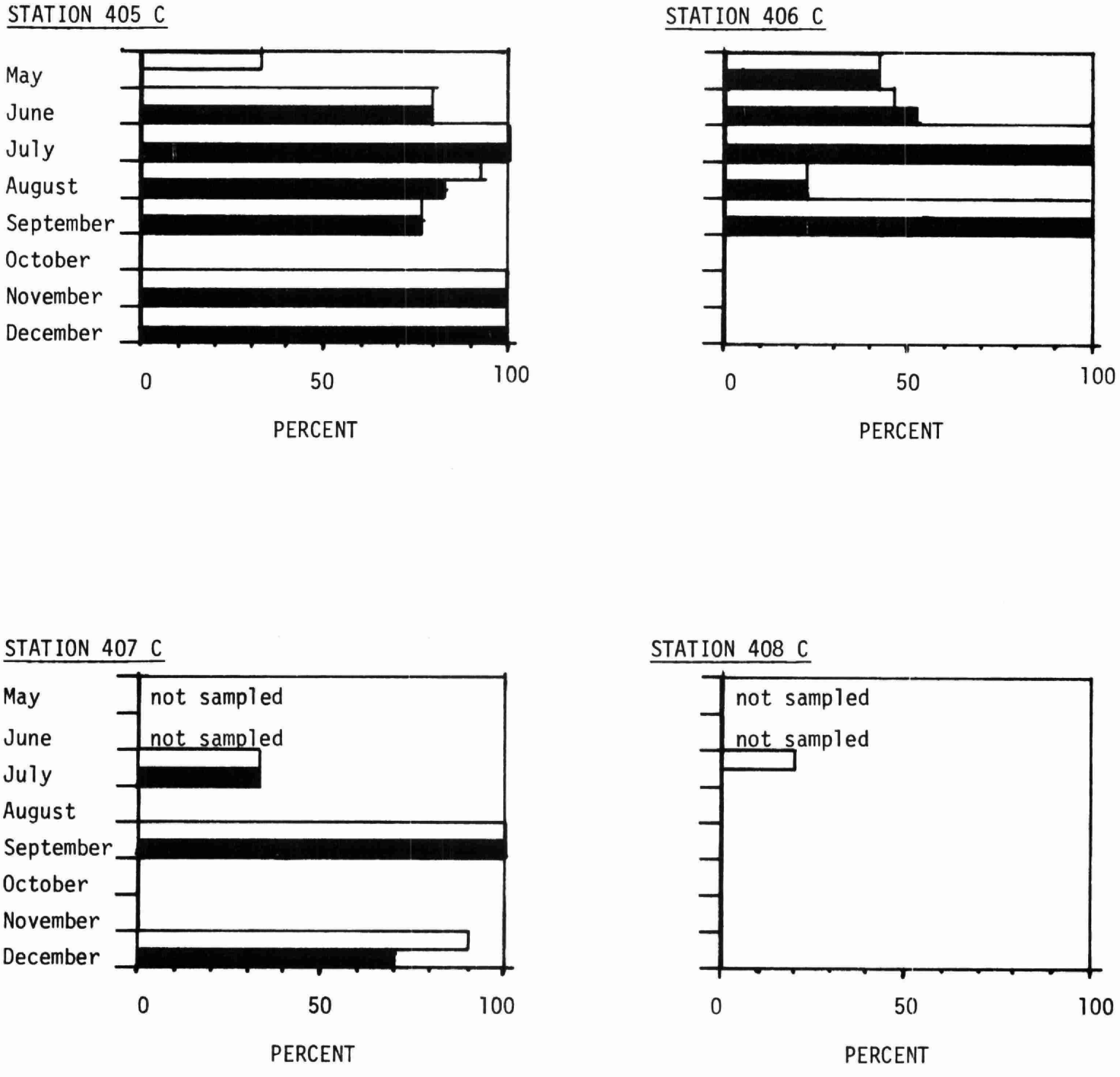


FIGURE TWO

PERCENT OF SAMPLES EXCEEDING O.W.R.C. BACTERIOLOGY CRITERIA

- DEPARTMENT OF LANDS AND FORESTS STUDY -



6.2 Significance of Results

The bay water quality was well within the acceptable bacteriological limits recommended by the O.W.R.C. at the time of the survey. Excessive coliform concentrations were found within the area of the bay confined by the causeway. The water there is relatively stagnant, quite shallow and warm; creating an environment which is ideal for the natural growth of these organisms. The analytical results further indicate that coliform bacteria are being added to the confined area by at least two spring-fed creeks. It is possible that pollutants are also gaining access from surface runoff during periods of heavy rainfall.

Samples collected during this survey indicate that the source of these bacteria can be attributed to the cottage development in the vicinity of the creeks.

The results of the Lands and Forests survey presented in Figure one indicate that the confined bay water (station 404 B) contained total coliform organisms in excess of the O.W.R.C. objectives during July, August, September, November and December. Figure two shows that an input of excessive coliform bacteria also occurred during the month of July (station 408 C).

Although the bacteriological water quality of the main portion of the bay was well within the O.W.R.C. criteria, the Lands and Forests survey of 1970 indicated that many of the samples collected between May and December contained excessive concentrations of total and faecal coliforms (see Figure one stations 401 B, 402 B and 403 B). These samples were collected along the shoreline and for a greater period of time than those of the O.W.R.C. survey. Consequently, the Lands and Forests results would realistically present the general quality of the waters immediately adjacent to the shoreline. It is quite possible that the warmer waters along the shoreline would support greater colonies of coliform bacteria than the cooler waters 100 to 200 feet out. Higher concentrations of coliform bacteria could also be found near the shoreline due to direct contamination of the waters by drainage ditches and creeks as well as from private cottages located there. The dilution factor as well as the temperature variance could then account for this phenomenon.

Concentrations of faecal coliforms of the magnitudes found in the ditches sampled indicate that faecal wastes are gaining access to the ground and surface run-off waters in the area. These bacteria could originate from wild or domestic animals in the area and/or from malfunctioning sewage disposal facilities. Because of the density of cottage development and the presence of a high water table in the area,it is more realistic to assume that the latter situation

exists. The presence of these bacteria in conjunction with the high BOD and nutrient concentrations would confirm that organic faecal wastes are probably contributing to the pollution of the roadside ditches and groundwater in Havilland Bay.

The monitoring programme conducted by the Department of Lands and Forests confirmed that a very high percentage of all ditch water samples obtained during the past year contained coliform organisms, including faecal coliforms, in excess of the O.W.R.C.'s criteria. The fact that high coliform counts were also obtained during the fall and winter months would further indicate that the pollution is occurring on an annual (continual) basis and being caused by local residences.

6.3 Ditching

In the early part of June 1971, the Department of Transport and Communications (formerly the Department of Highways) constructed roadside drainage ditches along the old Highway 17. Two off-take ditches were also excavated to direct the drainage waters into Havilland Bay.

During the survey carried out in conjunction with this report, it was observed that the roadside ditches were two to three feet in depth and contained water from a depth of a few

inches to over one foot. The contents appeared to be stagnant and supported great quantities of debris and algae. The section located on the east side of the old highway between the hotel and the Stockman residence emitted a noticeable "sewage odour" and supported a prolific growth of weeds.

Because the ditches contained stagnant water and the area is quite sandy, the excavation may have extended below the groundwater table. Such a condition would be undesirable in that a nuisance (odour and flies) and health (sanitary and safety) problem could result. A survey should be conducted to determine if such a condition exists and corrective action should then be taken to allow the ditch water to drain properly.

6.4 Past Action

In 1967 a property owner in Havilland Bay blocked one of the drainage creeks transversing his property in an effort to obtain action in curbing some of the pollutants being directed into it upstream of his home. The Sault Daily Star, carried a series of three articles, over a period of a few months, covering the progress that was being made.

The O.W.R.C. became involved with this problem in July 1967 when a site investigation revealed that many of the cottage owners and the hotel were contributing to the pollution

of the surrounding waters. It was suggested at that time that a communal sewage treatment facility would probably be required to ultimately solve the existing problem.

In January 1968 several cottage owners met in the City of Sault Ste. Marie to discuss the pollution problems. During this meeting it was disclosed to the press that a total of 30 coliform bacteria per 100 ml. sample was detected and that the bay was consequently "grossly polluted" (1). It was unfortunate that such a statement was made since it caused undue concern to the many recreational users of the bay. The O.W.R.C. criteria for total coliform bacteria in a natural watercourse is 1,000 per 100 ml. of sample and the Algoma Health Unit normally posts beaches as "unfit for swimming" when a concentration of 2,400 is reached.

It was decided during an inter-Departmental meeting held in the O.W.R.C.'s Toronto offices in January 1968 that the Department of Health would be taking steps to clear up pollution of the area. The survey mentioned in this report was subsequently conducted and the required corrections made on an individual basis.

6.5 Corrective Action

Steps should be taken by each individual cottage owner

(1) The Sault Daily Star, Second Section, Friday, January 19, 1968.

to have his sewage disposal facility examined by a qualified person and the necessary repairs carried out if required. The minimum depth requirement for isolating a field disposal bed from the high water table should be strictly adhered to during this investigation. If it is found to be impossible to meet this requirement, an alternative method of sewage disposal should be chosen. Should the water table be generally too high, further development of Havilland Bay utilizing an individual sub-surface disposal method should not be allowed.

7.0 SUMMARY AND CONCLUSION

On June 15, 1971 staff of the Ontario Water Resources Commission's District Engineers Branch carried out a pollution survey of a portion of Havilland Bay. Numerous water samples were obtained and a visual observation of the area was also made to determine the effect of the recent ditching on the surrounding watercourse. The Department of Lands and Forests and the Department of Health were contacted and the files of the O.W.R.C. and the Sault Daily Star were reviewed in an effort to obtain all related background information. A summary of the background information as well as the analytical result of this, and a past Department of Lands and Forests survey, was completed and studied.

It is concluded that domestic wastes are gaining access to the surface and groundwaters draining the settlement of Havilland Bay. This situation is probably a result of malfunctioning

septic tank systems located in an area predominated by a relatively high groundwater table. Examination and repairs, if necessary, should be carried out on an individual basis and if positive results cannot be achieved, a communal collector system with appropriate treatment works should be installed to alleviate the existing conditions. The past actions taken to have this situation resolved would in fact indicate that these systems cannot function properly in this area. Future development of Havilland Bay should therefore not be allowed until the appropriate works have been installed.

It is concluded that the bottom of the drainage ditches may be below the groundwater table and this could lead to the creation of health and nuisance problems.

8.0 RECOMMENDATIONS

It is recommended that:

1. All existing sewage disposal facilities in the area be examined by a qualified person and revamped where necessary to alleviate the existing pollution problems.

2. A follow-up survey should be conducted to establish if correction on an individual basis achieved the desired results.

3. The future development should not be permitted on the basis of septic tank disposal of wastes unless these systems can be shown to be workable.

4. The drainage ditch elevations be related to the groundwater table (Lake Level) and adjusted where necessary to permit the flow of water.

5. A communal sewage collector system complete with adequate treatment facilities be installed if the implementation of recommendation No. 1 fails to alleviate the existing situation.

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/bw

APPENDIX A

TOWNSHIP

of

HAVILLAND

(UNORGANIZED)

HAVILLAND BAY

Bay water bacteriological results

of Department of Lands and

Forests Samples (1970)

Stations:
- 401-B May 1970 to Dec. 1970
- 402-B May 1970 to Dec. 1970
- 403-B May 1970 to Dec. 1970
- 404-B May 1970 to Dec. 1970
- 405-C May 1970 to Dec. 1970
- 406-C May 1970 to Dec. 1970
- 407-C July 1970 to Nov. 1970
- 408-C July 1970 to Dec. 1970

DATA SUMMARY

STA.	LOCATION	MONTH	NO. OF SAMPLES	TOTAL COLIF. >1,000 (1)	PERCENT COLIF. >1,000	FAECAL COLIF. >100 (1)	PERCENT COLIF. >100	MAX. TOTAL COLIF. (1)	MAX FAECAL COLIF. (1)
401 B	Bathing Area	May	5	0	0	0	0	250	4
		June	14	2	14	2	14	20,000	2,000
		July	12	2	5	5	42	2,000	1,000
		Aug.	12	3	25	6	50	2,000	1,500
		Sept.	10	0	0	7	70	500	200
		Oct. (2)	10	0	0	0	0	115	22
		Nov. (2)	10	0	0	0	0	220	4
		Dec. (2)	10	0	0	0	0	0	0
402 B	Bathing Area	May	5	0	0	0	0	450	10
		June	14	3	21	1	7	76,000	120
		July	12	6	50	1	8	50,000	600
		Aug.	12	3	25	7	58	10,000	3,100
		Sept.	10	7	70	7	70	7,000	2,000
		Oct. (2)	9	0	0	0	0	50	16
		Nov. (2)	10	0	0	0	0	30	4
		Dec. (2)	10	0	0	0	0	15	0

STA.	LOCATION	MONTH	NO. OF SAMPLES	TOTAL COLIF. >1,000	PERCENT COLIF. >1,000	FAECAL COLIF. >100	PERCENT COLIF. >100	MAX. TOTAL COLIF.	MAX. FAECAL COLIF.
403 B	Bathing Area	May	5	1	20	0	0	3,200	40
		June	14	2	14	4	29	85,000	9,800
		July	13	2	15	6	46	2,200	1,400
		Aug.	12	0	0	0	0	140	88
		Sept.	10	0	0	10	100	500	300
		Oct. (2)	11	0	0	0	0	20	12
		Nov. (2)	10	0	0	0	0	45	8
		Dec. (2)	10	0	0	0	0	50	12
404 B	Bathing Area	May	0	-	-	-	-	-	-
		June	14	1	7	0	0	5,400	80
		July	12	1	8	3	25	1,400	160
		Aug.	12	3	25	9	75	1,700	820
		Sept.	10	4	40	10	100	1,000	300
		Oct. (2)	10	0	0	0	0	75	22
		Nov. (2)	10	0	0	9	90	900	520
		Dec. (2)	10	0	0	5	50	770	260

(1) Organisms per 100 ml of sample
(2) Based on a single day sampling
(>) Greater than

DATA SUMMARY

STA.	LOCATION	MONTH	NO. OF SAMPLES	(1) TOTAL COLIF. >1,000	PERCENT COLIF. >1,000	(1) FAECAL COLIF. >100	PERCENT COLIF. >100	(1) MAX. TOTAL COLIF.	(1) MAX. FAECAL COLIF.
405 C	Drainage Creek	May	3	1	33	0	0	12,000	34
		June	15	12	80	12	80	> 300,000	> 300,000
		July	13	13	100	13	100	80,000	9,700
		Aug.	12	11	92	10	83	600,000	4,000
		Sept.	13	10	77	10	77	30,000	14,000
		(2) Oct.	10	0	0	0	0	50	24
		(2) Nov.	10	10	100	10	100	28,000	1,400
		(2) Dec.	10	10	100	10	100	40,000	1,660
406 C	Drainage Creek	May	7	3	43	3	43	30,000	150
		June	15	7	47	8	53	76,000	2,300
		July	14	14	100	14	100	250,000	80,000
		Aug.	13	3	23	3	23	21,000	4,300
		Sept.	10	10	100	10	100	10,000	2,000
		(2) Oct.	10	0	0	0	0	100	48
		(2) Nov.	10	0	0	0	0	145	6
		(2) Dec.	10	0	0	0	0	30	6

STA.	LOCATION	MONTH	NO. OF SAMPLES	TOTAL COLIF. >1,000 (1)	PERCENT COLIF. >1,000 (1)	FAECAL COLIF. >100 (1)	PERCENT COLIF. >100	MAX. TOTAL COLIF. (1)	MAX. FAECAL COLIF. (1)
407 C		July	6	2	33	2	33	3,000	760
		Aug.	8	0	0	0	0	580	84
		Sept. (2)	9	9	100	9	100	10,000	1,500
		Oct. (2)	10	0	0	0	0	90	8
		Nov. (2)	10	0	0	0	0	410	76
		Dec. (2)	10	9	90	7	70	1,300	208
408 C		July	5	1	20	0	0	2,500	34
		Aug.	8	0	0	0	0	280	28
		Sept. (2)	10	0	0	0	0	100	50
		Oct. (2)	10	0	0	0	0	30	2
		Nov. (2)	10	0	0	0	0	70	18
		Dec. (2)	10	0	0	0	0	0	0

(1) Organisms per 100 ml of sample
(2) Based on a single day sampling
(>) Greater than

APPENDIX B

TOWNSHIP

of

HAVILLAND

(UNORGANIZED)

HAVILLAND BAY

- Map of study area -

(see map pocket at end of report)

APPENDIX C

TOWNSHIP

of

HAVILLAND

(UNORGANIZED)

HAVILLAND BAY

- Definition of Terms -

APPENDIX C

DEFINITION OF TERMS

BOD (Biochemical Oxygen Demand)

The Biochemical Oxygen Demand (BOD) is a measure of the amount of oxygen required for the natural stabilization of decomposable organic matter present in sewage. O.W.R.C. objectives allow concentrations in natural waters and waste discharges of no greater than 4.0 and 15.0 ppm (parts per million) respectively.

SOLIDS

The solids content of a liquid is expressed as total, suspended, and dissolved solids. The latter is determined by subtracting the first two solids and all three are expressed in ppm. The suspended solids figure is the most important since it represents that portion which is carried down-current and later deposited. The O.W.R.C.'s objective for discharge of this material is a concentration less than 15 ppm.

PHOSPHORUS

Phosphorus is an essential plant nutrient and is believed to play an important role in the deterioration of the quality of natural waterways by promoting an overabundance of plants. It occurs in natural and waste waters in several different chemical combinations,

such as orthophosphate (PO_4), organic phosphates and polyphosphates. Since most or all of these forms can eventually be used by plants and animals, determination of the total phosphorus concentration is more relevant than measurement of individual phosphorus compounds. Algae blooms have been known to result when concentration of phosphorus in the range of 0.01 ppm is present.

NITROGEN (N)

Nitrogen is an essential plant nutrient and is believed to play an important role in the deterioration of the quality of natural waterways by promoting an overabundance of plants. The critical concentration of nitrogen above which algae blooms result has been established by some authorities as 0.30 ppm.

TOTAL COLIFORMS

Coliform bacteria are commonly found in the intestinal tract of man and other animals. They are therefore used as an indication of pollution. In polluted water, their concentration is roughly proportional to the degree of sewage contamination present. The acceptable limit for natural watercourses is a concentration of less than 1000 organisms per 100 millilitres of water. This criterion (geometric mean) is based on the results of at least 10 samples.

FAECAL COLIFORMS

The faecal coliforms are coliform bacteria usually associated only with the faecal discharges of man and other warm or cold blooded animals and as such their presence in a water body indicates that faecal wastes are gaining access to it. When this coliform is present in a water, it is assumed that the water is potentially dangerous and should not be used for drinking or other domestic purposes. Where ingestion is probable, such as in recreational waters, the water is considered impaired when the faecal geometric mean density exceeds 100 of at least ten samples per month.

SAULT STE. MARIE

LAKE SUPERIOR

HAVILLAND BAY

TRANS CANADA HWY. 17

OLD HWY 17

OLD HWY. 17

WAWA

STOKLEY

CREEK

CREEK

CREEK

STORE

MOTEL

HOTEL

1 TC-40 FC-<10

2 TC-1,500 FC-30

3 TC-3,900 FC-70

4 TC-1,800 FC-30

5 TC-10 FC-<10

6 TC-120 FC-<10

7 TC-170 FC-10

8 TC-190 FC-<10

9 TC-10 FC-<10

10 TC-90 FC-<10

11 TC-10 FC-<10

12 TC-<10 FC-<10

13 TC-10 FC-<10

14 TC-10 FC-<10

15 TC-10 FC-<10

16 TC-<10 FC-<10

17 TC-290 FC-100

18 TC-110 FC-<10

19 TC-100 FC-<10

20 TC-<10 FC-<10

21 TC-250 FC-<10

22 TC-500 FC-30

23 TC-360 FC-10

24 TC-390 FC-40

25 TC-130 FC-<10

26 TC-390 FC-10

27 TC-250 FC-<10

28 TC-2,000 FC-160

29 TC-580 FC-<10

30 TC-1,400 FC-210

31 TC-14,800 FC-340

32 TC-56,000 FC-340

33 TC-50,000 FC-300

34 TC-3,100 FC-100

35 TC-29,000 FC-<10

36 TC-2700 FC-30

37 TC-300 FC-200

38 TC-140 FC-<10

39 TC-900 FC-200

40 TC-<10 FC-<10

401B

402B

403B

404B

405C

406C

407C

408C

LEGEND

SAMPLING STATION

10 TC-90 FC-<10

< - MEANS "LESS THAN"
TC - " TOTAL COLIFORM ORGANISMS PER 100ml SAMPLE
FC - " FECAL COLIFORM " " " "

401B - DEPT. OF LANDS & FORESTS SAMPLING POINTS

ONTARIO WATER RESOURCES COMMISSION

TOWNSHIP OF HAVILLAND (UNORGANIZED)
HAVILLAND BAY

SCALE: 1"=200 FT	
DRAWN BY: R.S.	DATE: AUGUST 1971
CHECKED BY:	DRAWING Nº: 71-73-DE